

WHAT IS CLAIMED IS:

1. An exhaust brake comprising:

5 a body having a passageway for exhaust gases therein;

a valve member movably located within the passageway for selective movement between an open position where the valve member opens the passageway and exhaust gases are free to move through the passageway and a closed position where the valve member blocks the passageway and the passage of exhaust gases through the passageway, the valve member having an aperture therethrough to permit a limited flow of exhaust gases through the aperture when the aperture is open;

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an exhaust valve actuator mechanism coupled to the valve member for moving the valve member between the open position and the closed position;

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a closure member positioned adjacent to the aperture, the closure member having an open position where the closure member is spaced apart from the valve member and permits a flow of exhaust gases through the aperture, and the closure member having a closed position where the closure member contacts the valve member about the aperture and inhibits a flow of exhaust gases through the aperture; and

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a relief actuator mechanism, the relief actuator mechanism including an actuator member which operatively engages the closure member, the relief mechanism bringing the closure member into operative engagement with the valve member with sufficient force, when the valve member is closed, to maintain the closure member in the closed position when the exhaust gases are below a predetermined pressure.

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2. The exhaust brake as claimed in claim 1, wherein the actuator member is pivotally mounted and is biased against the closure member.

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3. The exhaust brake as claimed in claim 2, wherein the actuator member is pivotally mounted at a pivot point exterior to the passageway.
4. The exhaust brake as claimed in claim 3, wherein the actuator member is biased by a  
5 biasing mechanism exterior to the passageway.
5. The exhaust brake as claimed in claim 4, wherein the biasing mechanism includes a spring.
- 10 6. The exhaust brake as claimed in claim 4, wherein the biasing mechanism includes a fluid actuator.
7. The exhaust brake as claimed in claim 4, wherein the biasing mechanism includes an electric actuator.
- 15 8. The exhaust brake as claimed in claim 1, wherein the closure member is movably connected to the valve member.
9. The exhaust brake as claimed in claim 8, wherein the actuator member is separate  
20 from the closure member and contacts the closure member to bias the closure member towards the closed position.
10. The exhaust brake as claimed in claim 8, including elongated projections extending from the valve member about the aperture, the closure member having apertures  
25 slidably receiving the elongated projections.
11. The exhaust brake as claimed in claim 10, wherein the projections are pins.
12. The exhaust brake as claimed in claim I, wherein the closure member is connected to  
30 the actuator member.

13. The exhaust brake as claimed in claim 1, wherein the actuator member is selectively biased against the closure member by a spring, a secondary actuator being engageable with the spring to selectively engage said spring with the actuator member.
- 5 14. The exhaust brake as claimed in claim 13, including a controller for disengaging said spring from the actuator member, whereby engaging or disengaging said spring provides two different levels of pressure relief.
- 10 15. The exhaust brake as claimed in claim 3, wherein the actuator member includes a bimetallic element exterior to the passageway to compensate for temperature fluctuations exterior to the passageway.
- 15 16. The exhaust brake as claimed in claim 1, wherein said relief actuator mechanism allows the closure member to move to the open position when the exhaust gases are above the predetermined pressure.
17. The exhaust brake as claimed in claim 1, wherein the body and the valve member are components of a butterfly valve.
- 20 18. The exhaust brake as claimed in claim 4, wherein the actuator member is selectively biased against the closure member by a pair of nested springs, a secondary actuator engaging one or both of said springs with the actuator member.
- 25 19. The exhaust brake as claimed in claim 4 including a secondary actuator connected to a member which holds the closure member selectively in a closed position against the pressure of exhaust gases.
20. The exhaust brake as claimed in claim 19, wherein the secondary actuator is electronically controlled.
- 30 21. The exhaust brake as claimed in claim 20, wherein the secondary actuator is electronically controlled by a controller according to pressure of exhaust gases.

22. The exhaust brake as claimed in claim 21, wherein the secondary actuator is electronically controlled by a controller according to temperature of exhaust gases.

5 23. A method for preventing excessive pressure buildup in an exhaust brake for an internal combustion engine, said brake having a passageway for exhaust gases, a valve member movably located within the passageway for selective movement between an open position, where the valve member opens the passageway and exhaust gases are free to move through the passageway, and a closed position where the valve member blocks the passageway and inhibits the passage of exhaust gases through the passageway, the method comprising:

10 providing an aperture through the valve member to permit a limited flow of exhaust gases through the aperture when the aperture is open;

15 positioning a closure member adjacent to the aperture so the closure member has an open position where the closure member is spaced apart from the valve member and permits a flow of exhaust gases through the aperture, the closure member having a closed position where the closure member contacts the valve member about the aperture and inhibits a flow of exhaust gases through the aperture;

20 providing a relief actuator mechanism, the relief actuator mechanism including an actuator member which operatively engages the closure member; and

25 bringing the closure member into operative engagement with the valve member with sufficient force, when the valve member is closed, to maintain the closure member in the closed position when the exhaust gases are below a predetermined pressure.

30 24. The method as claimed in claim 23, wherein the actuator member is pivotally mounted and is biased against the closure member.

25. The method as claimed in claim 24, wherein the actuator member is pivotally mounted at a pivot point exterior to the passageway.
26. The method as claimed in claim 25, wherein the actuator member is biased by a  
5 biasing mechanism exterior to the passageway,
27. The method as claimed in claim 26, wherein the biasing mechanism includes a spring.
28. The method as claimed in claim 26, wherein the biasing mechanism includes a fluid  
10 actuator.
29. The method as claimed in claim 26, wherein the biasing mechanism includes an electric actuator.
- 15 30. The method as claimed in claim 23, wherein the closure member is movably connected to the valve member.
31. The method as claimed in claim 30, wherein the actuator member is separate from the closure member and contacts the closure member to bias the closure member towards  
20 the closed position.
32. The method as claimed in claim 31, including elongated projections extending from the valve member about the aperture, the closure member having apertures slidably receiving the elongated projections.  
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33. The method as claimed in claim 32, wherein the projections are pins.
34. The method as claimed in claim 23, wherein the closure member is connected to the actuator member.  
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35. The method as claimed in claim 23, wherein the actuator member is selectively biased against the closure member by a spring, a secondary actuator being engageable with

the spring to selectively engage said spring with the actuator member.

36. The method as claimed in claim 35, including a controller for disengaging said spring from the actuator member, whereby engaging or disengaging said spring provides two different levels of pressure relief.

37. The method as claimed in claim 23, wherein the actuator member includes a bimetallic element exterior to the passageway to compensate for temperature fluctuations exterior to the passageway.

38. The method as claimed in claim 23, wherein said relief actuator mechanism allows the closure member to move to the open position when the exhaust gases are above the predetermined pressure.

39. The method as claimed in claim 23, wherein the body and the valve member are components of a butterfly valve.

40. The method as claimed in claim 23, wherein the actuator member is selectively biased against the closure member by a pair of nested springs, a secondary actuator being engageable with the spring to selectively engage one or both of said springs with the actuator member.

41. The method as claimed in claim 23 including a secondary actuator connected to a member that holds the closure member selectively in a closed position against the pressure of exhaust gases.

42. The method as claimed in claim 41, wherein the secondary actuator is electronically controlled.

43. The method as claimed in claim 42, wherein the secondary actuator is electronically controlled by a controller according to pressure of exhaust gases.

44. The method as claimed in claim 43, wherein the secondary actuator is electronically controlled by a controller according to temperature of exhaust gases.

5 45. An internal combustion engine having an exhaust conduit with an exhaust brake connected thereto, the exhaust brake having a body with a passageway for exhaust gases therein; a valve member movably located within the passageway for selective movement between an open position where the valve member opens the passageway and exhaust gases are free to move through the passageway and a closed position where the valve member blocks the passageway and inhibits the passage of exhaust gases through the passageway, the valve member having an aperture therethrough to permit a limited flow of exhaust gases through the aperture when the aperture is open; an exhaust valve actuator mechanism coupled to the valve member for moving the valve member between the open position and the closed position; a closure member positioned adjacent to the aperture, the closure member having an open position, where 10 the closure member is spaced apart from the valve member and permits a flow of exhaust gases through the aperture, and the closure member having a closed position where the closure member contacts the valve member about the aperture and inhibits a flow of exhaust gases through the aperture; and a relief actuator mechanism, the relief actuator mechanism including an actuator member which operatively engages the 15 closure member, the relief mechanism bringing the closure member into operative engagement with the valve member with sufficient force, when the valve member is closed, to maintain the closure member in the closed position when the exhaust gases are below a predetermined pressure.

25 46. The engine as claimed in claim 45, wherein the actuator member is pivotally mounted and is biased against the closure member.

47. The engine as claimed in claim 46, wherein the actuator member is pivotally mounted at a pivot point exterior to the passageway.

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48. The engine as claimed in claim 47, wherein the actuator member is biased by a biasing mechanism exterior to the passageway.

49. The engine as claimed in claim 48, wherein the biasing mechanism is a spring.
50. The engine as claimed in claim 48, wherein the biasing mechanism is a fluid actuator.
- 5 51. The engine as claimed in claim 48, wherein the biasing mechanism includes an electric actuator.
52. The engine as claimed in claim 45, wherein the closure member is movably connected  
10 to the valve member.
53. The engine as claimed in claim 52, wherein the actuator member is separate from the closure member and contacts the closure member to bias the closure member towards the closed position.
- 15 54. The engine as claimed in claim 53, including elongated projections extending from the valve member about the aperture, the closure member having apertures slidably receiving the elongated projections.
- 20 55. The engine as claimed in claim 54, wherein the projections are pins.
56. The engine as claimed in claim 45, wherein the closure member is connected to the actuator member.
- 25 57. The engine as claimed in claim 45, wherein the actuator member is selectively biased against the closure member by a spring, a secondary actuator being engageable with the spring to selectively engage said spring with the actuator member.
- 30 58. The engine as claimed in claim 57, including a controller for disengaging said spring from the actuator member, whereby engaging or disengaging said spring provides two different levels of pressure relief.



59. The engine as claimed in claim 45, wherein the actuator member includes a bimetallic element exterior to the passageway to compensate for temperature fluctuations exterior to the passageway.

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60. The engine as claimed in claim 45, wherein said relief actuator mechanism allows the closure member to move to the open position when the exhaust gases are above the predetermined pressure.

10 61. The engine as claimed in claim 45, wherein the body and the valve member are components of a butterfly valve.

62. The engine as claimed in claim 45, wherein the actuator member is selectively biased against the closure member by a pair of nested springs, a secondary actuator being engageable with the springs to selectively engage one or both of said springs with the actuator member.

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63. The engine as claimed in claim 45 including a secondary actuator connected to a member that holds the closure member selectively in a closed position against the pressure of exhaust gases.

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64. The engine as claimed in claim 63, wherein the secondary actuator is electronically controlled.

25 65. The engine as claimed in claim 64, wherein the secondary actuator is electronically controlled by a controller according to pressure of exhaust gases.

66. The engine as claimed in claim 65, wherein the secondary actuator is electronically controlled by a controller according to temperature of exhaust gases.

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